66291-332

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Min et al.

Filing Date: 2/14/02

Serial No.: TBA

Title: **Induction Devices With Distributed Air Gaps**

) Attorney Docket No.: 66291-332

) Examiner: TBA

) Art Unit: TBA

PRELIMINARY AMENDMENT

Director of Patents and Trademarks
Washington, D.C. 20231

2/14/02

Dear Sir:

The following Preliminary Amendment is being submitted simultaneously with the filing of a Continued Prosecution Application (CPA) of the parent application 09/537,748. The parent application (09,537,748) is a continuation-in-part of its parent application no. 09/318,817, both applications are herein incorporated in their entirety by reference. It is respectfully requested the following Preliminary Amendment be entered into the application, and the application be considered in view thereof. No new matter has been introduced into the application through this amendment. Please amend the application as follows:

I. Amendments

A. Specification

Please amend the first paragraph on page 1, lines 3-4 as follows. A marked-up version of this paragraph is attached at the end of this amendment.

- -This application is a continuation application of the parent application serial no. 09/537,748, filed 03/30/00 and is currently pending.- -

Please amend the last paragraph on page 13, lines 11-18 as follows. A marked-up version of this portion of the specification is attached at the end of this amendment:

- -The dielectric 40 may be an epoxy resin, polyester, polyamide, polyethylene, cross-linked polyethylene, PTFE (polytetrafluoroethylene) and PFA (polyperflouroalkoxyethylene or pheno-formaldehyde) sold under the trademark Teflon by Dupont, rubber, EPR (ethylene propylene rubber), ABS (acrylonitrile-butadiene-styrene), polyacetal, polycarbonate, PMMA (poly methyl methaacrylate), polyphenylene sulphone, PPS (polyphenylene sulphide), PSU (polysulphone), polysulfone, polyetherimid PEI (polyetherimide), PEEK (polyetheretherketone), and the like. As discussed in greater detail with respect to Fig. 8, the dielectric material 40 may also coat the particles 42. The magnetic particles 42 may be formed of iron, amorphous iron

based materials, Ni-Fe alloys, Co-Fe alloys, Mn-Zn, Ni-Zn, Mn-Mg and the like.- -

B. Claims

Please cancel claims 1-19, and insert the following new claims into the application:

- -20. (New) An induction device having a core and a distributed air gap, comprising:

an air gap insert for providing reluctance in said air gap;

said air gap insert is a dielectric container; and

said induction device has a transition zone comprising a plurality of magnetic permeability values.

21. (New) The induction device according to claim 20, wherein:

said core has opposed free ends forming an interface with said air gap insert;

said air gap insert has a magnetic permeability value;

said opposing free ends of said core have a magnetic permeability value;

said core has a magnetic permeability value;

said permeability value of said air gap insert is less than said magnetic permeability value of said opposing free ends;

said permeability value of said opposing free ends is less than said magnetic permeability value of said core; and

the differences in magnetic permeability values form said transition zone.

22. (New) The induction device according to claim 21, wherein:

said dielectric container is filled with magnetic particles.

23. (New) The induction device according to claim 22, wherein:

said magnetic particles are in a dielectric matrix.

24. (New) The induction device according to claim 23, wherein:

said magnetic particles are coated with a coating of diealectric matrix.

25. (New) The induction device according to claim 22, wherein:

said container is flexible; and

a force applied to said air gap insert changes the density of said magnetic particles and thereby changes the reluctance in said air gap.

26. (New) The induction device according to claim 25, wherein:

said density of said magnetic particles is adjustable by a factor of 2-4 times the magnetic permeability in response to said force being applied to said air gap insert.

27. (New) The induction device according to claim 26, wherein:

said core is comprised of at least one of:

a) a magnetic wire,

b) a ribbon of magnetic material, and

c) a magnetic powder metallurgy material.

28. (New) The induction device according to claim 22, wherein:

said interface is planar.

29. (New) The induction device according to claim 22, wherein:

said interface is curved.

30. (New) The induction device according to claim 22, wherein:

said interface is jagged.

31. (New) An induction device having a core and a distributed air gap, comprising:

an air gap insert for providing reluctance in said air gap;

said air gap insert is a multi-component structure; and

said induction device has a zone of transition with more than one value of magnetic permeability.

32. (New) The induction device according to claim 31, wherein:

said multi-component structure has a central portion and end portions.

33. (New) The induction device according to claim 32, wherein:

said central portion has a permeability value;

said end portions have a permeability value;

said core has a permeability value;

said permeability value of said central portion is less than the permeability value of said end portions;

said permeability value of said end portions is less than said permeability value of said core; and

said difference of permeability values forms said transition zone.

34. (New) The induction device according to claim 33, wherein:

said central portion is filled with magnetic particles in a matrix of dielectric material; and

said end portions are filled with chopped magnetic wire.

35. (New) The induction device according to claim 33, wherein:

said central portion is filled with magnetic particles in a matrix of dielectric material; and

said end portions are filled with chopped magnetic wire in a matrix of dielectric material.

36. (New) The induction device according to claim 33, wherein:

said core is comprised of at least one of:

a) a magnetic wire,

b) a ribbon of magnetic material, and

c) a magnetic powder metallurgy material.

37. (New) An induction device having a core and a distributed air gap, comprising:

an air gap insert for providing reluctance in said air gap;

said core has a plurality of wires, a portion of said plurality of wires is inserted into said air gap insert; and

said induction device has a zone of transition with more than one value of magnetic permeability.

38. (New) The induction device according to claim 37, wherein:

said air gap insert has a permeability value;

said portion of said plurality of wires has a permeability value;

said core has a permeability value;

said permeability value of said air gap insert is less than said permeability value of said portion of said plurality of wires;

said permeability value of said portion of said plurality of wires is less than said permeability value of said core; and

said difference in permeability values forms said transition zone.- -

39. (New) An induction device formed with a core having a region of reduced permeability in a portion thereof comprising:

a distributed air gap insert disposed in the portion of the core formed of finely divided magnetic particles in a matrix of a dielectric material,

wherein said air gap provides reluctance in the portion of the core having a region of reduced permeability.

40. (New) The induction device according to claim 39, wherein the dielectric material comprises at least one of a gas, a liquid, a solid and combinations thereof.

41. (New) The induction device according to claim 39, wherein the particles have a particle size and volume fraction sufficient to provide an air gap with reduced fringe effects.

42. (New) The induction device according to claim 39, wherein the particle size is in a range of 1nm to 1mm.

43. (New) The induction device according to claim 39, wherein the particle size is in range of about 0.1μm to about 200μm.

44. (New) The induction device according to claim 39, wherein the particles occupy the matrix in a range of up to 60% by volume.

45. (New) The induction device according to claim 39, wherein the matrix includes a polymeric material.

46. (New) The induction device according to claim 45, wherein the polymeric material is a material selected from the group consisting of epoxy resin, polyester, polyamide, polyethylene, cross-linked polyethylene, PTFE, PTA, rubber, EPR, ABS, polyacetal, polycarbonate, PMMA, PPS, PSU, and PEEK.

47. (New) The induction device according to claim 45, wherein the dielectric material comprises a ferrite having a permeability greater than 1.

48. (New) The induction device according to claim 47, wherein the ferrite has a permeability of about 10.

49. (New) The induction device according to claim 39, wherein the [magnetic] dielectric material comprises a material selected from the group consisting of ferrites, silicon steel iron, amorphous iron-based material, Ni-Fe alloys, Co-Fe alloys, Mn-Zn, Ni-Zn, Mn-Mg.

50. (New) The induction device according to claim 39, wherein the distributed air gap insert comprises a dielectric container having a hollow interior and filled with the distributed air gap material.

51. (New) The induction device according to claim 50, wherein the container is flexible.

52. (New) The induction device according to claim 51, wherein the density of the particle is selectively adjustable by a factor of about 2-4 times the magnetic permeability in response to a force applied to the container.

53. (New) The induction device according to claim 52, wherein the force is isotropic.

54. (New) The induction device according to claim 39, wherein the core comprises at least one part made of a magnetic laminate, a ribbon of magnetic material, and a magnetic wire.

55. (New) The induction device according to claim 39, further including an elongated, dielectric container having a hollow interior portion filled with the distributed air gap material.

56. (New) The induction device according to claim 54, wherein the container comprises a hose.

57. (New) The induction device according to claim 53, wherein the hose is

flexible.

58. (New) The induction device according to claim 39, wherein the matrix comprises a dielectric coating surrounding the magnetic particles.- -

59. (New) An induction device formed with a core having a region of reduced permeability in a selected portion thereof comprising:

a distributed air gap material disposed in the selected portion of the core; and

a winding comprising an electric field confining cable.

60. (New) The induction device according to claim 59, wherein the cable comprises a conductor, an inner semiconducting layer surrounding the conductor, an insulating layer surrounding the inner layer and an outer semiconducting layer surrounding the insulating layer.

61. (New) The induction device according to claim 59, wherein the distributed air gap material comprises finely divided magnetic particles in a matrix of a dielectric material.

62. (New) The induction device according to claim 59, wherein the matrix comprises a dielectric coating surrounding the magnetic particle.

63. (New) An induction device having a core and an air gap, comprising:

an air gap insert for providing reluctance in said air gap;

said air gap insert is a dielectric container having an interior filled with magnetic powder particles in a dielectric matrix;

said core having opposing free ends forming an interface with said air gap insert;

said interior of said air gap insert, said opposing free ends and said core each have a permeability value;

said permeability value of said interior is less than said permeability value of said opposing free ends; and

said permeability value of said free ends is less than said permeability value of said core;

wherein said differences in said permeability values create a magnetic transition between said core and said air gap.

63. (New) An induction device having a core and an air gap, comprising:

an air gap insert for providing reluctance in said air gap;

said air gap insert is a multi-component structure with a central portion between two end portions;

said central portion, said end portions and said core each have a permeability value;

said permeability value of said central portion is less than said permeability

value of said end portions; and

said permeability value of said end portions is less than said permability value of said core.

65. (New) The induction device according to claim 55, wherein:

said central portion is filled with magnetic particles in a matrix of dielectric material, and

said end portions are comprised of pieces of magnetic wire in said matrix of dielectric material.

66. (New) The induction device according to claim 55, wherein:

said central portion is filled with magnetic particles in a matrix of dielectric material; and

said end portions are comprised of pieces of magnetic wire.

67. (New) The induction device according to claim 39, further comprising:

a magnetic means in said air gap material for providing a smooth magnetic transition from said core to said air gap.- -

II. Remarks

A. General

Claims 1-19 have been canceled and new claims 20-67 have been added to the

application. No new matter has been added to the application through the addition of claims 20-67.

This present continuation application is to be considered an ENKEL case, and it is respectfully requested that this application be included among the ENKEL applications which are being handled pursuant to a Decision on Petition dated December 1, 1999. As such, it is believed all the claims belong in this single application.

B. Specification

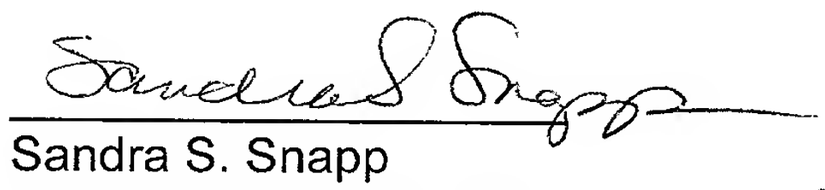
The specification has been amended to more clearly define what the different chemical compounds are.

III. Conclusion

The application has been preliminarily amended to place it into condition for allowance.

If any other issues are outstanding and it would expedite the prosecution of this application, the Examiner is encouraged to contact, by telephone, the attorney of record at the following number.

Respectfully submitted,



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Marked-up version of specification for cont. appl. of 09/537,748

Please amend the specification in the first paragraph of page 1, lines 3-4 as follows:

- -This application is a [continuation-in-part] continuation application of the parent application serial no. [09/318,817] 09/537,748, filed [05/26/99] 03/30/00 and is currently pending.- -

Please amend the specification on the last paragraph of page 13, lines 10-18 as follows:

- -The dielectric 40 may be an epoxy resin, polyester, polyamide, [polyamide,] polyethylene, cross-linked polyethylene, PTFE (polytetrafluoroethylene) and PFA (polyperflouroalkoxyethylene or phenol-formaldehyde) sold under the trademark Teflon by Dupont, rubber, EPR (ethylene propylene rubber), ABS (acrylonitrile-butadiene-styrene), polyacetal, polycarbonate, PMMA (poly methyl methaacrylate), polyphenylene sulphone, PPS (polyphenylene sulphide), PSU (polysulphone), polysulfone, polyetherimid PEI (polyetherimide), PEEK (polyetheretherketone), and the like. As discussed in greater detail with respect to Fig. 8, the dielectric material 40 may also coat the particles 42. The magnetic particles 42 may be formed of iron, amorphous iron based materials, Ni-Fe alloys, Co-Fe alloys, Mn-Zn, Ni-Zn, Mn-Mg and the like.- -